

RADIUM

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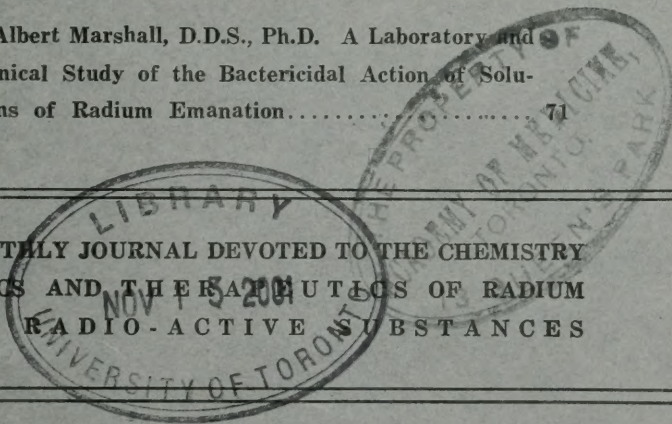
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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY
PHYSICS AND THERAPEUTICS OF RADIUM
AND RADIO-ACTIVE SUBSTANCES



RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND
THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

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VOL. XVIII

JANUARY-FEBRUARY, 1922

Nos. 4-5

RADIUM AND DEEP THERAPY IN THE TREATMENT OF MALIGNANCY*

By Russell H. Boggs, M.D., Pittsburgh, Pa.

A review of radiotherapy, including both radium and x-ray treatment during the past twenty years shows it has passed through at least four or five different stages in attaining the position it occupies today. When we first started to treat with the x-ray, extravagant claims were made, which were unjustifiable and, on account of the inefficient equipment and lack of technic, only superficial instead of deep treatment was given. All obtained results in the treatment of basal cell epithelioma, but the percentage of cures was much lower than we obtain today, while squamous cell epitheliomas, on account of the inefficient technic, seldom responded. Today we are curing nearly all rodent ulcers or basal cell epitheliomas and a large percentage of squamous epitheliomas. In the early days no filtration and little or no cross-firing was used. Later, a millimeter of aluminum or a piece of sole leather was employed for filtration. Such great improvement in treating cases of carcinoma followed this technic that it was only a short time until three and finally ten millimeters of aluminum were employed in the treatment of all deep-seated lesions.

At present there are new transformers on the market in which high voltage (twenty inches spark-gap) is employed to excite the x-ray tube.

*Read before the Roentgen Ray Society of Central Pennsylvania, at Altoona, October 29, 1921.

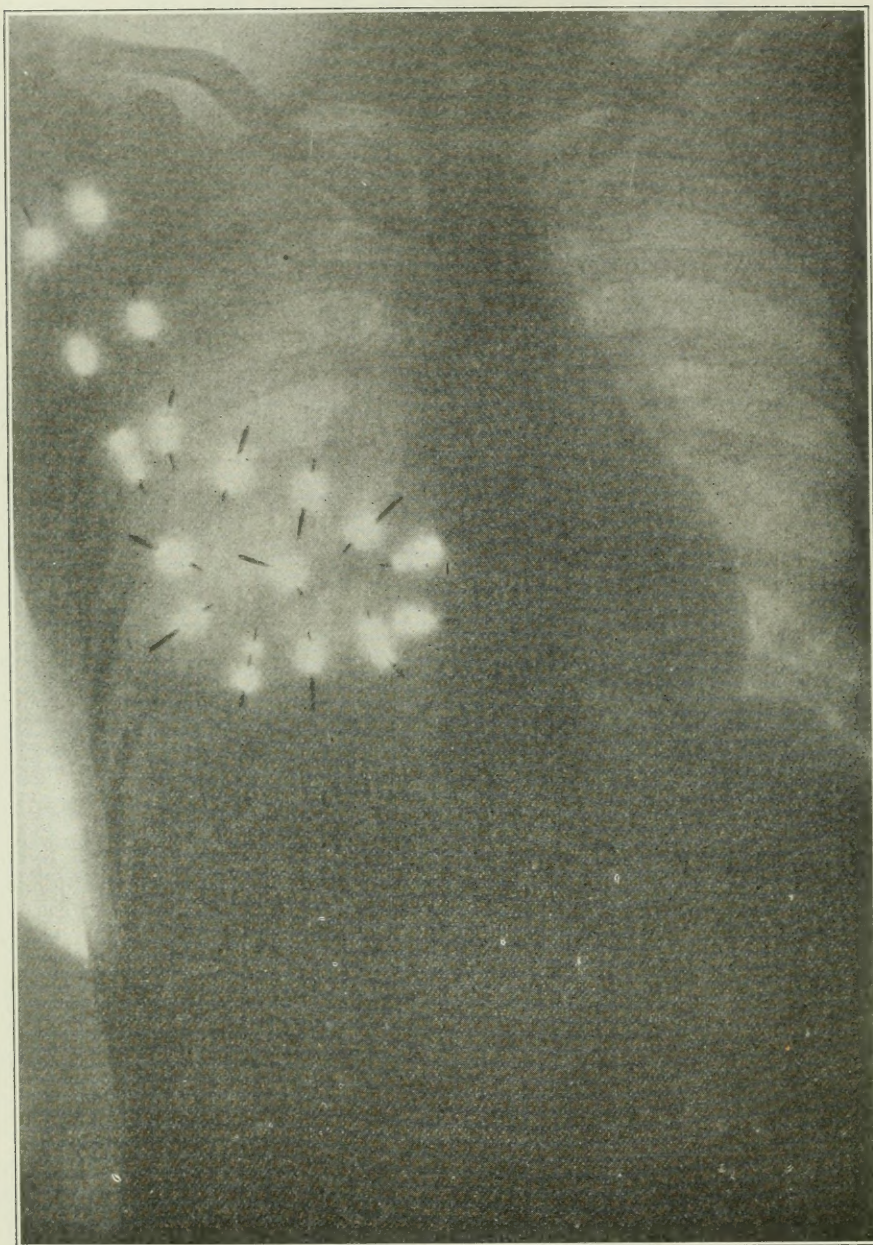


Figure 1. Showing the manner in which the needles were distributed, as well as the radiation in treatment of breast cancer. Patient was lying on her face with radium needles distributed over skin surface (not implanted) the sensitive film being in contact with the radium needles. Illustration does not refer to a case under treatment.

This will necessarily make a complete change in our technic and, until it is thoroughly mastered, great caution should be used; otherwise undesirable results will be produced. These machines are being installed

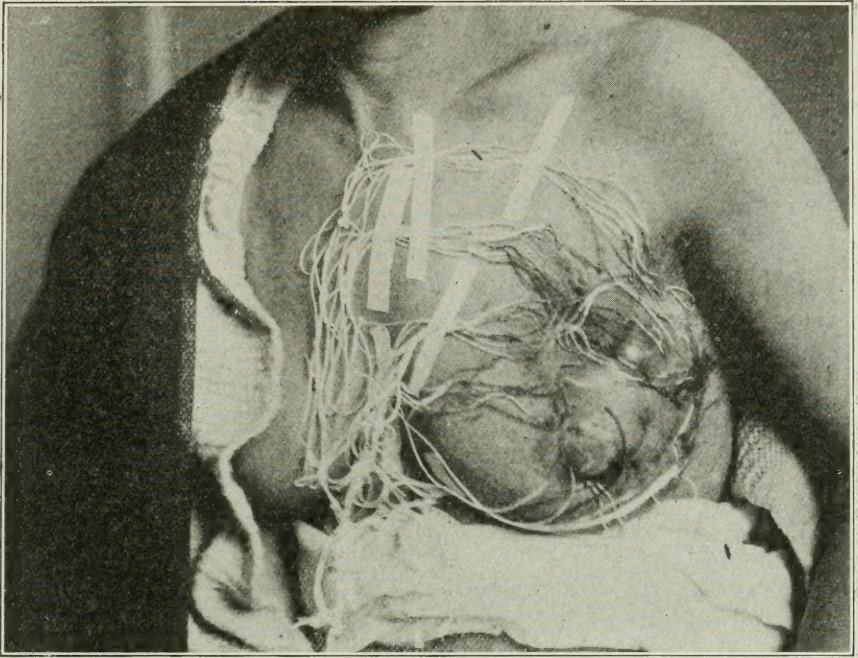


Figure 2. Miss J. Advanced inoperable carcinoma of the breast. 35 needles inserted for five hours. Patient greatly improved.

at about twenty times the expense of the apparatus which we employed fifteen years ago. Therefore, many will never install such an apparatus where the work is largely diagnostic. These therapeutic machines will not be as efficient for diagnosis as the shorter spark transformers.

Radium therapy has undergone the same rapid advancement in regard to filtration, quantity employed, etc. A few years ago an attempt was made to treat cancer with small quantities of radium with inefficient technic, which was usually unsuccessful, whereas today similar cases are being treated with small and large quantities of radium, prescribed according to size or depth of the lesion, just the same as any drug is prescribed in the treatment of a disease, with decidedly better and more uniform results. Many malignant cases are now treated by imbedding radium into and underneath the cancerous growth.

Radium and the x-ray have superseded surgery in the treatment of some types of malignancy. The surgeons have tried conscientiously, but unsuccessfully, to avoid the possibility of leaving any cancer cells behind by the removal of all lymphatics draining the cancer area, thus sacrificing many important structures. In the end they found that the dissection left cancer cells behind and very few cases were cured by operation alone in which there were palpable glands adjacent to a malignant growth or when more than one chain of lymphatics was involved microscopically. This was the means of influencing a few of the broader-minded surgeons to advise ante- and post-operative radiation.

When radium or x-ray is employed, it is imperative that a lethal dose be given to all deep carcinomatous tissues. It usually requires

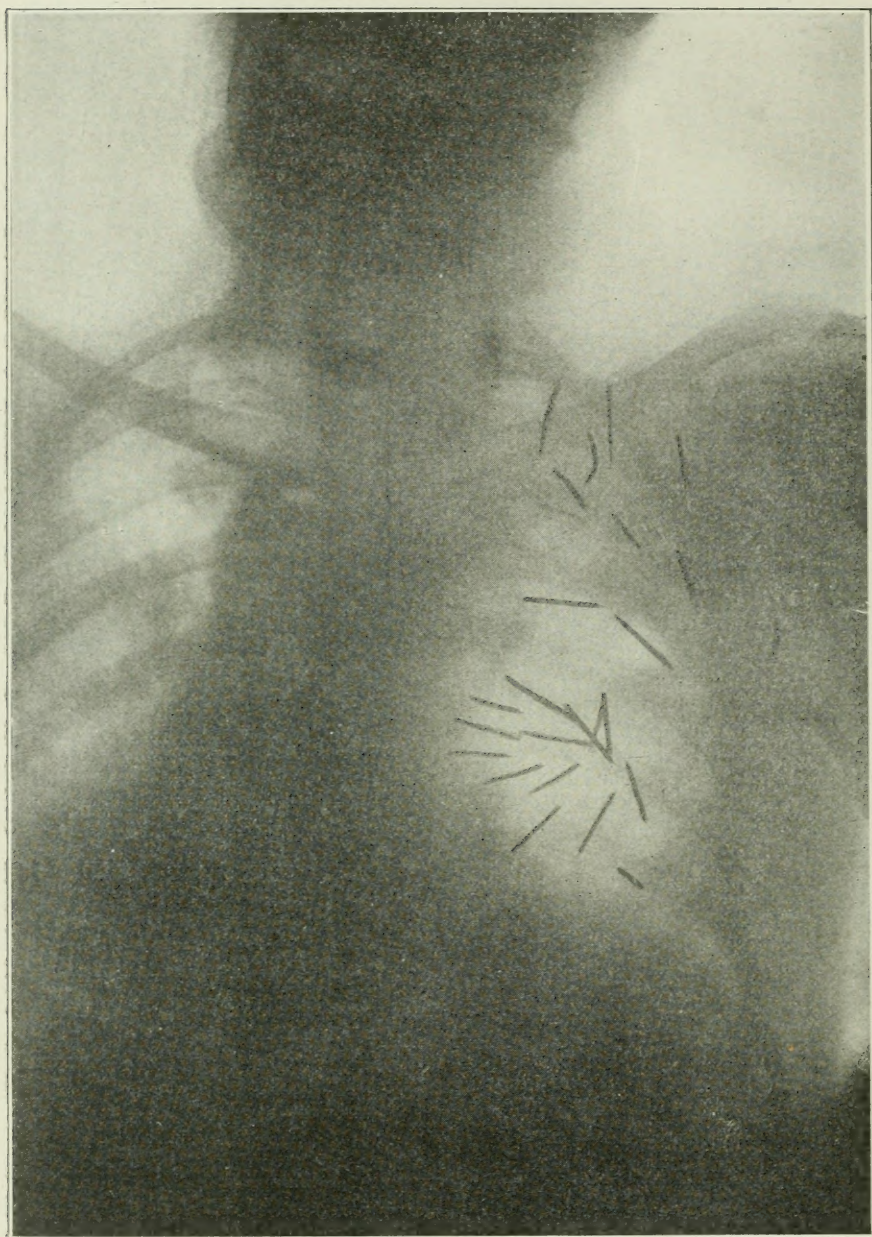


Figure 3. Showing the manner in which the radium needles were distributed for carcinoma of the breast. The 10 mgm. radium needles were implanted in the growth for 8 hours. A total of 35 needles was employed.

from seven to ten skin erythema doses to give a lethal dose four inches below the surface of the skin. This amount of cross-firing has been used by very few radiologists during the past five years. It remains to be seen whether one or two large ports of entry, as used by the Ger-

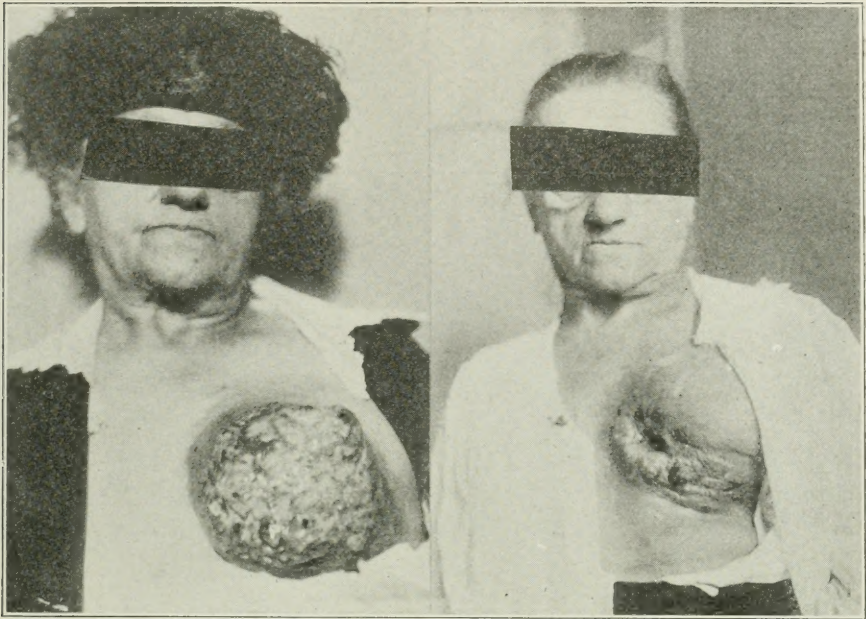


Figure 4. Mrs. S. Advanced carcinoma of left breast. 1500 mg hrs. of radium used directly over breast, supplemented by x-ray over all other areas. (At right) six months later.

mans, will produce better results than smaller ports of entry with more cross-firing. Regardless of the method employed a lethal dose must be given.

Radium is not only the most efficient method we have in treating epithelioma, but it is the most efficient method we possess in the treatment of malignant growths of the mouth and throat. Lesions in the mouth and throat are more malignant and metastasize early; therefore, a lethal dose must be given to the local lesion and the adjacent lymphatic glands. The glands on both sides of the neck are closely connected, and when the cancer cells have reached one chain, it is only a short time until the other chains metastasize.

Epitheliomatous growths of the tongue and floor of the mouth, as well as those of the tonsil, even when the lesions are advanced and breaking down, have been clinically cured by surface applications of radium, followed by inserting radium into and around the growth or by electric coagulation. Since we have been imbedding radium, better results have been obtained than by cautery or any other method.

Epithelioma or cancer of the mouth and throat shows itself by its progressive extension of the primary growth, and there is almost always an early invasion of the lymphatics of the neck, while secondary involvement of distant organs or tissue rarely occurs. Formerly it was said that there was a collar around the neck through which cancer cells rarely penetrated. This is not true, because by the older methods of treatment, death occurred from the local or regional disease before

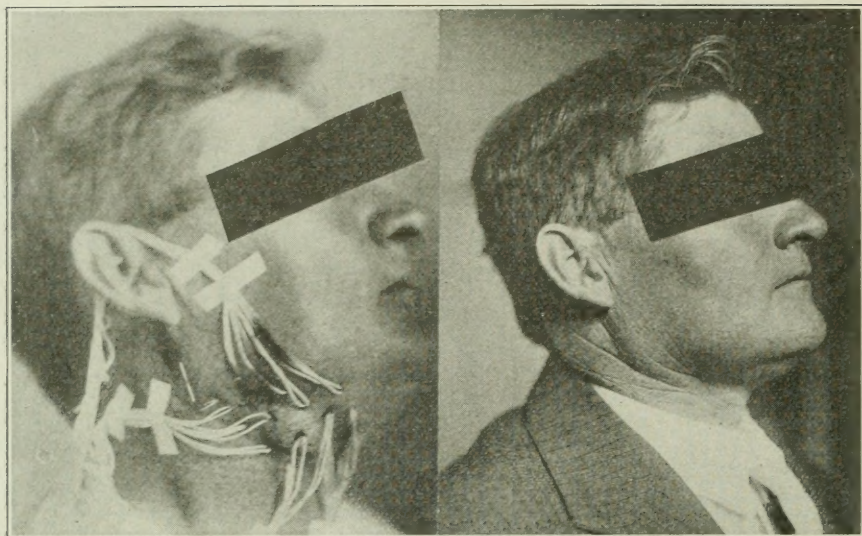


Figure 5. Mr. L. Carcinoma of the submaxillary glands. Eighteen 10 mg. needles inserted for three hours.

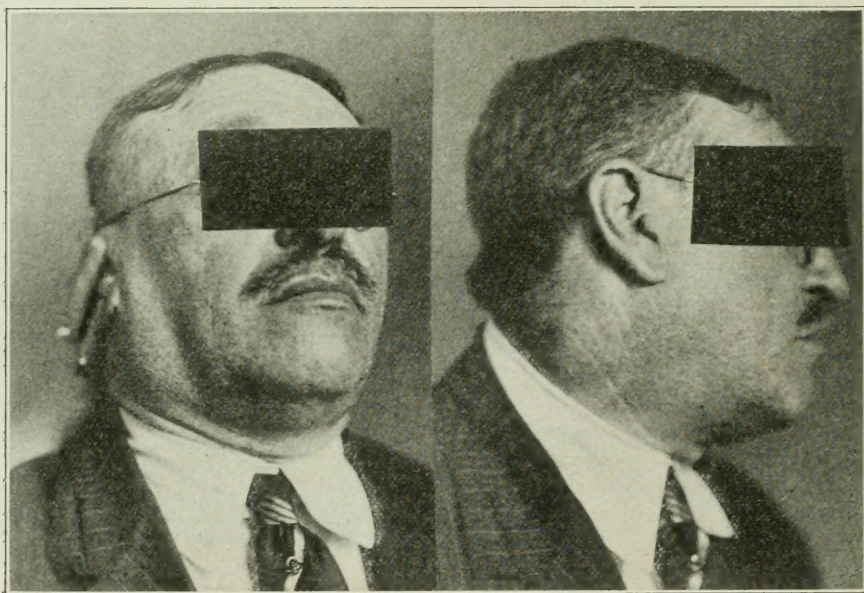


Figure 6. Mr. F. Lympho-sarcoma of upper right cervical glands. Seventeen 10 mg. needles inserted for four hours. Two months later, fourteen 10 mg. needles inserted for 2½ hours. (At right) Result seven months later.

there was sufficient time for secondary deposits to become active. A review of any recent system of surgery shows that even most of the early cancerous lesions exhibit only the visible part of the disease, but



Figure 7. Showing distribution of needles in carcinoma of the tonsils. 15 needles each containing 10 mgm. inserted for 3 hours. Patient clinically cured nearly 1 year.

there usually is a cancerous dissemination in the lymphatic spaces and the glands are invaded at a considerable distance from the primary focus, even at an early stage of the disease. It is true that the cancer-growing edge, although not recognized by ordinary methods of examination, is definite. When more than one lymphatic chain in the neck has been found microscopically to contain cancer cells and when the deep cervicals are involved, the cases are not cured surgically. It is important for the radiologist to know what glands drain each area of the mouth and throat as well as the anastomosis of the lymphatic system.

Carcinoma of the tongue is one of the most difficult of the mouth lesions to treat and the most difficult to obtain complete retrogression, because even in the early cases the glands have metastasized, minute processes often have invaded muscle substance for a considerable depth and if the growth is situated in the posterior part of the tongue there is an early invasion of the tissue towards the tonsil. Therefore, the groove between the tongue and tonsil should always receive radiation. The method that should give the best results is extensive surface radia-



Figure 8. Showing distribution of needles in carcinoma of the tongue. Needles of 10 mgm. content inserted 5 hours. Patient clinically cured.

tion, together with intensive radiation of the lymphatics, burying radium needles two to four weeks later in the posterior half of the tongue and in the tissue in front of the tonsil and in the tonsil on the affected side. This should be followed in some cases by electric-coagulation.

In the treatment of the lymphatics radiation should be as thorough as possible, and even then, like a thorough dissection, it often is not radical enough. If an operation is performed it should be preceded by radiation because raying should destroy the small deposits in the glands which are not palpable or at least check proliferating cancer cells. By waiting five or six weeks after raying the primary growth the cancer cells are far on toward retrogression. Besides, there is not the same danger of spreading cancer cells. It is claimed that the lymph nodes do for a time check cancer cells. While radium has many shortcomings in the treatment of cancer of the tongue, it is a step in advance, and with improved technic more should be accomplished in the future.

Primarily all epithelioma or cancer of the lower lip should be treated by radium and surgery should be reserved for correcting the deformity in cases in which the disease has caused loss of tissue before

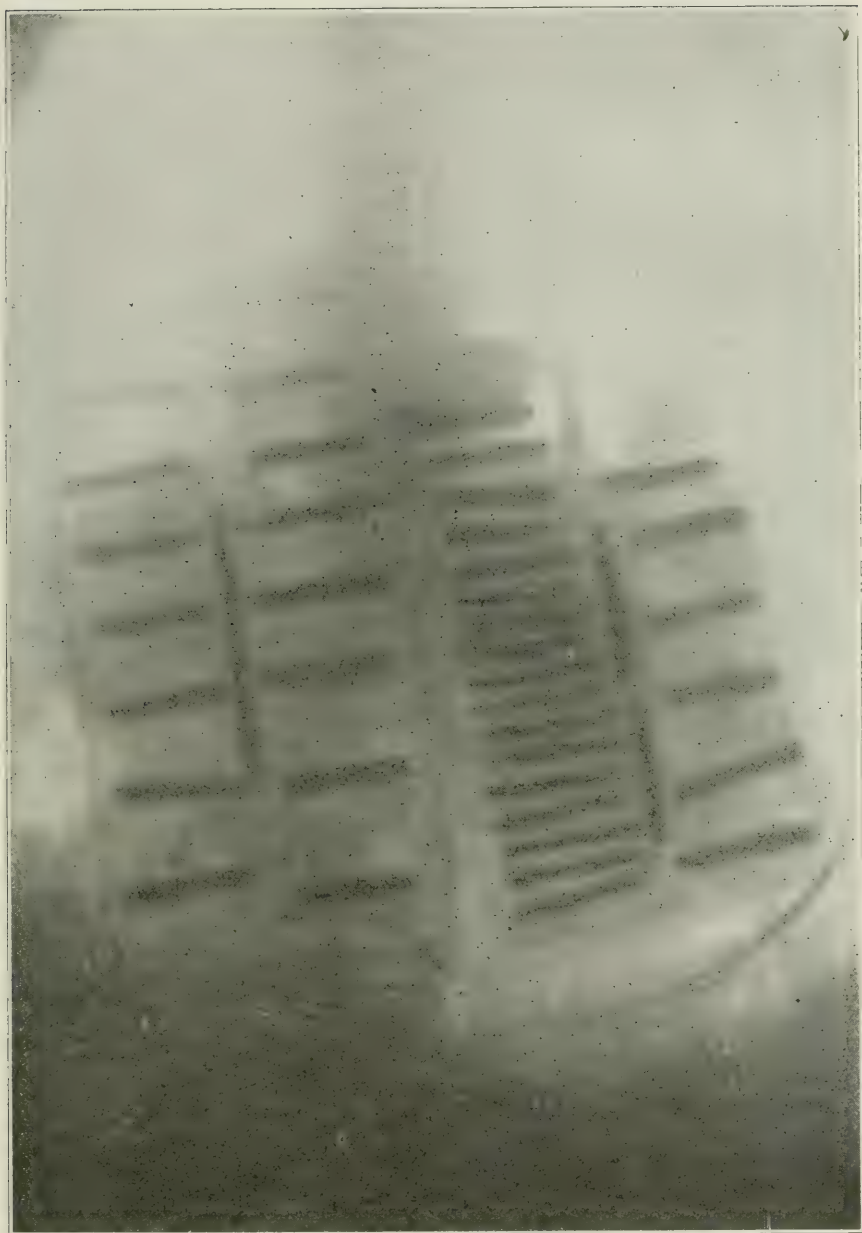


Figure 9. Mr. C. Carcinoma of the stomach given 15,000 mg. hrs. of radium. Patient improved temporarily. 1,000 mgm. radium used on pack 15x15 cm. at 4 cm. from the skin surface.

radiation was begun and for the removal of vestiges of the disease which remain in the muscle tissue after advanced cases have been radiated. The lymphatic glands in both sides of the neck should receive thorough radiation and, if any glandular involvement is present, radium should be



Figure 10. Mrs. S. Carcinoma of the vulva. Twenty 10 mg. needles inserted for three hours. Patient greatly improved.

imbedded into the palpable cancer enlargements. If epithelioma of the lip is removed surgically the routine bilateral block dissection has been followed as the orthodox procedure. Then why omit radiating these glands in both early and late cases?

The following are some of the reasons why lower lip cancer should be treated by radium:

First, more cases can be cured.

Second, the disease can be successfully removed in a large percentage of the cases without opening the lymphatics.

Third, no deformity is caused by the treatment.

Fourth, the deformity in removing a primary growth from the lip by the V-shape incision is an uncomfortable deformity, especially if a thorough operation is performed. Because of the great sacrifice of tissue, there is always a hesitancy on the part of the surgeon to remove sufficient tissue, and afterwards the contraction is often sufficient to irritate the scar, which may be the exciting cause of a prompt recurrence.

Fifth, patients will submit to radiation and will come earlier when they realize that they can be treated successfully with radiation without operation.

For these reasons the treatment of cancer of the lip with radium deserves the foremost place.

Sarcoma of the tonsil and throat can nearly always be cured clinically by radiation within a comparatively short time, but within a year or two a recurrence takes place in nearly all cases. Formerly we did not seem to realize the extreme malignancy of sarcoma and did not

treat at sufficient distance from the primary lesions. We were satisfied when the lesion, filling up the greater part of the throat, responded and there was no clinical evidence of sarcoma in the tissue. In treating sarcoma of the tonsils and throat the glands of both sides of the neck, as well as the mediastinum, should receive deep radiation. Experience taught us that if treatment is stopped after local treatment is given, we will nearly always have a recurrence. It remains to be seen what our results are going to be by more thorough radiation and a follow-up system of these cases.

Cancer of the breast, on account of its lymphatic supply, may extend to almost any organ of the body, and for this reason it is more difficult to eradicate all cancer cells, whether the method selected is surgical or radiological. A study of the lymphatics which metastasize in breast carcinoma shows why only localized growths are cured by surgery alone. It has been known for a long time that, even when the cancer is confined to the breast, four out of five cases are cured surgically, and when the axilla is microscopically involved, one out of five is cured by radical operation. When the axillary glands are palpable very few cases are cured surgically. It has been estimated that this is between four and five percent. The results from surgical operation, of both early and late cases, have caused a general dissatisfaction among the medical profession and is sufficient reason for employing radium and the x-ray in every case. Most surgeons have not realized that ante-operative raying is more important than post-operative. Of course, both are advisable. The reason as before stated for wide and extensive raying is that almost any organ of the body may metastasize from cancer of the breast, and however much confined to the superficial tissue the growth may seem to be, no one can tell where the cancer growing edge may extend. This is undetected by ordinary methods of examination.

The same law holds good in the treatment of carcinoma of the breast as elsewhere, that is, ante-operative raying checks cell proliferation and produces more or less of a sclerosis. The sclerosis makes the lymphatic system a barrier against the spreading of cancer cells during an operation.

Radiation before and after operation will unquestionably be the method of choice in the treatment of all early cases of cancer of the breast and, in nearly all late and advanced cases, radiation without operation will give the best result and the greatest amount of palliation. The method which the writer has adopted is to give surface application of radium or the x-ray, using high penetrating radiation and as much cross-firing as possible in order to give a deep depth dose. Radiation for carcinoma of breast means that every chain of lymphatics which metastasize should receive a lethal dose. Treating the breast area and axilla omits so many lymphatic chains which metastasize that nothing is accomplished as far as the end results are concerned. Two or three weeks following this surface application after cell proliferation has been checked and the cancer cells have become more or less latent, radium needles are inserted throughout the breast, into the axillary glands and the glandular tissue extending from the breast to the axilla and also beneath the clavicle. This makes radiation more thorough, because so much more radiation can be given by imbedding radium without injury to the skin. While many of these early cases are clinically cured, in most instances it seems advisable to remove the breast and some of the adjacent tissue to be sure that no cancer cells are left behind. In the

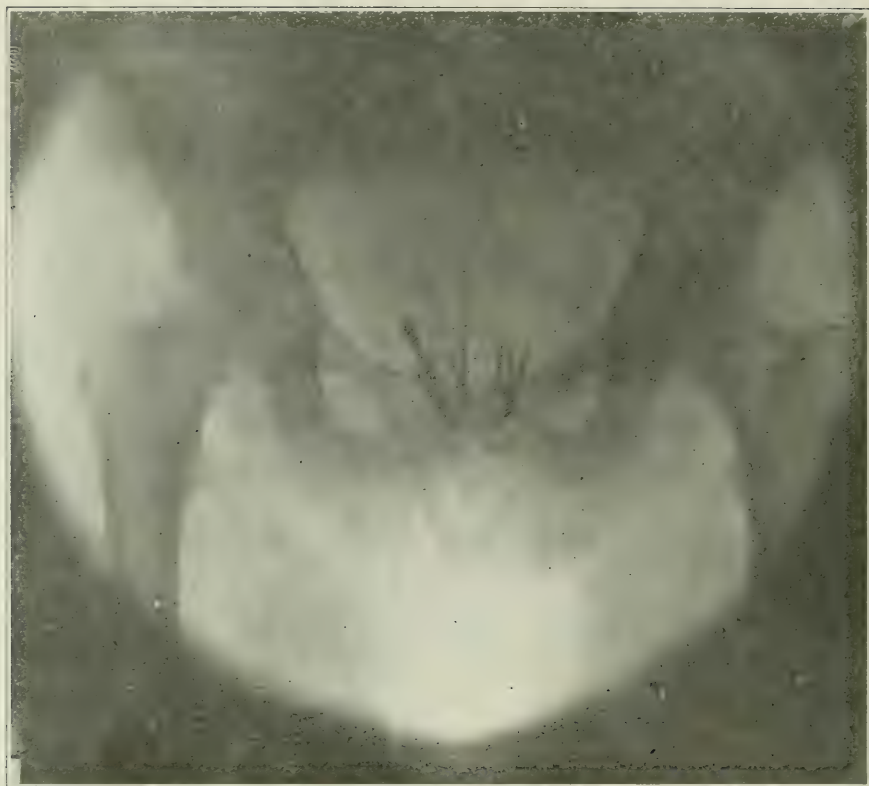


Figure 11. Radium treatment of inoperable carcinoma of the cervix uteri. Had previously received radium treatment elsewhere. Present treatment consists in insertion of ten 10 mgm. needles for 5 hours with massive doses of heavily screened x-rays from without. Advance of growth had obliterated cervical canal making necessary implantation of needles. Further radium treatment may be necessary.

late cases the method just described is at least superior to any form of operation primarily and in these cases, if the breast is removed, at least the axilla should seldom be opened following radiation. Finally, probably the safest method in all early cases is to give surface application of radium or the x-ray, two or four weeks later imbed radium, and then from four to eight weeks later remove the breast and as much of the adjacent tissue as is deemed necessary; and to depend upon radium and the x-ray in advanced cases and in some of these late cases to remove the breast without opening the axilla.

As a primary procedure gynecologists were the first surgeons to advise primary treatment of carcinoma of the cervix and uterus by radium. The results obtained in far advanced and border-line cases and a number of recurrences following early operations, raised the question as to whether radium treatment or surgical removal offered the most in primary cases. Today nearly all gynecologists consider cancer of the cervix and uterus a surgical condition, but they are dissatisfied with the end results. Many gynecologists and surgeons are using inefficient quantities of radium with poor technic and are omitting the treatment of adjacent glands by deep roentgen therapy. During the past



Figure 12. Inoperable cancer of rectum treated with 150 mgm. of radium applied in 5 tubes for 5 hours. The radium capsules were embedded in heavy soft gum rubber shaft outline of which shows in illustration.

twenty years the gynecologists have improved their surgical technic from time to time removing more tissue until extremely radical operations have been performed. However, surgically there are not many more cases cured than there were fifteen or twenty years ago at a certain stage of the disease, except by the Wertheim operation, which is considered too radical by most authorities. The improvement in surgical technic reduced the mortality from an operative standpoint more than it increased the number of patients cured at the end of five years. It has been shown in the different surgical clinics that only about seven or eight percent. of the patients coming for treatment are free from carcinoma of the cervix at the end of five years. Therefore, it is imperative that at least ninety percent. of the cases of carcinoma of the cervix should have the benefit of radium.

Cancer of the cervix is being treated in a number of different ways:

First—Those using radium locally.

Second—Those who use radium locally, giving rather large doses intro-uterine and also by packing radium around the cervix or carcinomatous mass in the vagina and treating with large packs of radium from the outside.

Third—Those who use rather large doses of radium or all the tissues will stand locally, and deep roentgen therapy from the outside.

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Fourth—Those who are depending entirely on very high penetrating x-ray without using any radium locally.

It seems that those who have made an extensive study of this subject are familiar with the results produced by giving as much radium locally as the tissues will stand and as much radiation externally as the skin will tolerate are producing the best results. The most plausible reason why this method has not been universally adopted is that many of those treating carcinoma of the cervix and uterus have radium only in small quantities and are not familiar with deep roentgen technic; others do not have radium and have been carried somewhat too far by the reports from the German clinics. It certainly seems unwise to attempt to destroy cancer cells in the pelvis through the skin if it can be treated locally by radium, and it is certainly just as unwise to expect to kill cancer cells in the adjacent glands at any great distance by the use of radium applied locally.

Unfortunately a large percentage of the cases are not being treated intelligently. The treatment of cancer by radiation is a specialty and unless the gynecologist makes a comprehensive study of this subject he is bound to do more harm than good. On the other hand, unless the radiologist is able to diagnose and differentiate the different stages and types of the disease, he is treating his cases just in the same manner as the gynecologist who knows practically nothing about radiation. It is neither the occasional brilliant result nor the failure that counts in this kind of work, but it is the correct analysis of all cases with full histories and careful follow-up records that will give us the real value of this procedure.

Before an operation is performed radium should always be considered, because the end results even by the combination of surgery and radiotherapy are still far from being satisfactory. Time would not permit to go into detail to classify the different groups clinically, nor to describe results which have been achieved by radium alone, or with radium in conjunction with surgery, but it will be sufficient to say that radium is a specific palliative in inoperable cancer of the cervix and uterus. It will clinically cure about one-third of the inoperable cases and subjective improvement is noticed in nearly all others. However, in these far advanced cases there is usually so much adjacent glandular involvement that the disease is only checked for a time (from six months to three years). During this time the patient regains normal health and can lead a useful life. In these hopeless cases, the offensive discharge disappears within from two to four weeks after the treatment has been given. The deodorizing and sterilizing effect of radium is very remarkable in the inoperable and recurrent cases where there is broken down cancerous tissue. The early cases can be clinically cured by radium, but whether the end results will be superior or equal to surgical removal no one can tell at the present time, but in the border-line and advanced cases better results are obtained by radium and deep roentgen therapy.

* * * *

REVIEWS AND ABSTRACTS

Arnold Schwyzer, M.D. (St. Paul, Minn.) Radium; Its Therapeutic Uses in Surgery. Minnesota Medicine, Sept. 1921.

"The uterus is a favorable area for the treatment of its tumors, and here indeed did we see the first striking results. I have observed cessation of profuse menorrhagia in uterine fibroid and an almost complete disappearance of the fibroid itself which was the size of a three months' pregnancy, after one 24 hours application of 50 milligrammes of radium element. And the radium was only applied vaginally. I have not used the radium in fibroids larger than a uterus 4 months pregnant. The generally accepted technic is the intra-uterine application of radium in these cases. I have persisted in the simple vaginal introduction combined with external application over the lower abdomen. Unless there are complications like inflammatory changes of the adnexa or similar special reasons, we prefer radium to operations in the moderate sized fibroids."

"In simple uterine bleeding, meno- or metrorrhagic a diagnostic curettage should be made in all cases. Intra-uterine application of radium can be combined at once, or the radium may be introduced vaginally. In intra-uterine application nausea may be severe, a watery discharge may follow the treatment at times for even months, and if even very slight and quite old inflammatory residues exist in the adnexa, intra-uterine radium treatment is a mistake which revenges itself most unpleasantly. It is necessary to tell the patients beforehand of the possible sequelæ, especially of nervous symptoms in case a suppression of the menses is strived at, otherwise a sense of disappointment multiplies the regular menopause molimina, and the produce is charged to your medication."

"The most glorious results of radium therapy are seen in inoperable carcinoma of the uterus. Even badly advanced cervix carcinomas with involvement of the vagina forming foul ulcerated craters quite commonly improve so much that those practitioners and surgeons who have not seen this improvement before, are often not only elated but perplexed. Right here a word of warning is apropos. First of all the observations are not yet of many years' standing, though Heyman of Stockholm had in 66 cases 28.8 per cent. cures after 5 years. If a return of the growth occurs, and some very experienced men do not dare hope for a permanent cure in these cases, there comes a time when radium has no further staying effect; the growth then runs wild. The primary results vary greatly. Some patients stand the treatment with the greatest impunity, others not, especially when the rectum is involved. A moderate encroachment of the bladder is already less disastrous in our experience, as these forms of carcinomata remain local growths for a longer time. Carcinoma of the body of the uterus has such good surgical prognosis that its treatment is operative. One case where operation was ruled out, is well so far, but only of recent date. Particularly favorable cases for radium treatment are post-operative recurrences in the vagina. They may remain well. Even in other parts of the body these local implantations often seem to yield readily to radium, as after breast operations. One case of carcinoma of the alveolar process in which I made a resection of the upper jaw, had a recurrence in the wound of the

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incision of the cheek. It is now five and a half years since the operation and the patient, whom I met a short time ago, smoking a big cigar, is in splendid health."

"Speaking of carcinoma of the upper jaw I have two cases which have been operated upon elsewhere, and came to me as inoperable, three and three and a half years ago respectively. As we have done for more than ten years, we first resected atypically extensively and then applied the hot soldering iron to the limit of permissibility. This was also done in the two cases called inoperable, and 5000 milligramme-hours of radium were given starting a week or so after the operation and giving the whole dose within a week if possible. Both cases are still well and very happy."

"Carcinoma of the tongue, palate, pharynx and mouth. While writing this paper I have two patients in the hospital, who were both operated upon for carcinoma of the tongue. One had his operation a year ago. It was a carcinoma of the base of the tongue which we removed by a lateral submandibular incision. The tumor reached very close to the epiglottis. We removed the base of the tongue, going well beyond the midline and backward to the epiglottis removing even part of the mucosa covering the anterior surface of the epiglottis itself. Radium was placed into the bottom of the remainder of the tongue,—50 mgr. were left in place for 48 hours. This was a large dose, half of the amount used in full treatment of carcinoma of the uterus. We watched closely and with apprehension for possible sudden edema of the larynx, though the radium was placed as far from the epiglottis as feasible. No signs of choking occurred, but later on the wound gradually opened somewhat and now at the end of a year we put a pedunculated flap over the opening which was the size of an unpeeled almond, in the midst of which you could readily see the epiglottis and the scarry neighborhood of the base of the tongue."

"The other mentioned case of carcinoma of the tongue, where we removed over half of the base together with the tonsil and its two pillars and the adjoining portion of the pharynx after splitting the lower jaw in the midline, had too extensive an operation to make it advisable to add possible shock of radium immediately. An operation for strangulated femoral hernia—due to the coughing—three days after the tongue operation made us wait two weeks with the insertion of the radium. This case ought to be a rather favorable one, as the forms of tongue carcinoma, where we do not have large fungating ulcerating surfaces but rather moderately ulcerated hard nodes, are much more favorable, especially if the microscopic picture does not prove it to be of squamous cell type with horny pearls. In these latter forms the radium is rather powerless. Carcinoma of the tongue and the floor of the mouth is one of the saddest chapters in surgery, and if radium should prove to be of benefit as it seems to be, it is a real blessing."

"Endotheliomata and mixed tumors of the parotid gland are favorably influenced. Two of my cases are under complete control for 4 and 5 years, one of them after operative recurrence."

"Carcinoma of the pharynx and naso-pharynx are as a rule favorably influenced. One case came to us in June, 1919 with great dyspnea. A tumor of the size of a tangerine filled the back part of the mouth and pharynx. The patient was snorting with the mouth wide open. The first thing to do was a tracheotomy. Then plugging the entrance to the larynx we bluntly removed quickly the large mass from the posterior wall of the pharynx, inserted 50 mgr. of radium and packed tightly.

The tumor had also filled the entire naso-pharynx. This patient surprised us with a complete freedom from recurrence after more than two years, when he came to town with his sick wife."

"Carcinoma of the thyroid. Three cases of what seemed to be clinically and microscopically a struma proliferans of Langhans (a form of adenocarcinoma of a moderate malignancy) were extensively excised and strongly treated with radium. They are well, though operated upon 6 and 7 years ago. I do however not feel quite certain as to the diagnosis. One case of an enormous carcinoma of the thyroid, over-reaching the sternum downward for 7 cm., could be only partly excised. This was done in January 1918. Radium was used in maximal doses. In the first four months after the operation the 72-year old lady, gained from 118 lbs. to 176 lbs. Two years after the operation the neck was quite small and, though there was a hard induration around the trachea, the general condition was very acceptable. Six months later the patient died from what appeared to be pulmonary metastases."

"In another patient, a male, 45 years old, we made the diagnosis of struma maligna and excised the thyroid extensively, though not totally, in November, 1913. The tumor was somewhat larger than a man's fist and was situated in the left lobe. All was well then for two years, when he began to notice a renewed swelling. He did however not come back until March 1918, when I again found on the left side a fist sized tumor and a plum sized one low down on the right side. The left tumor was not movable upward and downward, and only very little sideways. We operated again, and had to resect the internal jugular vein for its whole length and two inches of the vagus nerve together with the tumor. About ten days after the operation we applied 3700 milligramme-hours of radium and six months later another 2500. During the year 1919 he had again twice radium, which held the growth in check, though it had made its appearance again. The last time he came for radium treatments was in August 1920. He was then in rather poor general condition."

"I report some of these operations together with the radium treatment to emphasize the necessity of using the several procedures conjointly. To get the best results it is necessary that the surgeon know the possibilities of radium and that the radium therapist be in close touch with the surgeon."

"In carcinoma of the esophagus the application must be made through the esophagoscope. Only temporary results can be expected here. Nevertheless we had at least one rather satisfactory temporary result. It was a man of about 45 years, who came to me January 1905 in a most pitiable condition. For one week previously, only thin broth could be swallowed and for the last two days not even water. Even the finest esophageal sounds could not be passed beyond a point about 6 cm. above the cardiac end of the stomach. With the esophagoscope we found a strictured hard area at the place mentioned with raw hard edges, an ulcerated stricturing carcinoma of the lower end of the esophagus."

"Fine silver-wire sounds could now be passed into the stomach with slight pressure. The stricture was about 6 cm. long. Unless one saw the narrow crater the probes would invariably be caught at the side of it. Dilatation then followed with gradually increasing sizes of the sounds, partly of olive shape. The effect upon the patient was marvellous. Even with what seemed to us a small opening he began to eat soft food to his heart's content and soon smilingly reported that he stole

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a piece of meat from his neighboring patient at the hospital, after which he was allowed to try all kinds of food."

"Within three weeks he gained twenty-six pounds. In order to do as much as possible beyond a simple palliative measure, and to give the patient all possible chances and at least some reasonable hope, we started to use radium. A glass tube containing a few milligrams of radium bromide was sewed into a piece of linen, and the whole was fastened to a silk thread. It was attached to the end of a sound and inserted into the crater without any screening. It was allowed to remain there up to thirty minutes at a time, in all about six times. After a few months (in May, 1905) the patient was better in appearance, weight, strength, mental condition. Not even then, however, could I insert a tube or probe without the use of the esophagoscope. I imagine it did not find the hard rigid area, but got caught against a portion outside of this hard ring. This patient then felt so well for a long time that he thought he was cured, and notwithstanding my urging him to come at intervals to see me he did not show any more. His difficulty re-appeared later, and he died about a year after his first visit to me. While the decided temporary result was apparently due to the mechanical dilatation, I cite this case as it occurred one year before Bircher published his claim of being the first to use radium in esophagus cancer by esophagoscopy."

"The malignant tumors of the mediastinum are a most important field for the use of radium. They are mostly sarcomata and lymphosarcomata. For the present our only hope in nearly all of these cases lies in the roentgen rays and more especially in radium. Very large doses of radium with sufficient filtering to remove all but the hardest gamma rays seem necessary, according to Burnam of John Hopkins University who reports most remarkable results. He used only those radium rays which were left after filtering with 3 mm. of lead. If the radium can be introduced into the tumor mass, smaller quantities may be sufficient."

"Permit me to report a case in this connection: On February 21, 1917, a gentleman of 26 years consulted me for a mediastinal angiosarcoma. The clinical picture was typical. Our patient was cyanosed. His face was puffed up, the eyes glossy, the veins of the neck distended. Pain in the chest was complained of. A moderate but annoying dry cough existed; pulse 125, temperature 99.8/10°. For many weeks the patient had not been able to sleep in bed or to lie down on account of his dyspnea. Over the upper part of the sternal region there was a bulging, which was soft to the touch like an angioma. The diameter was about 10 cm. At the periphery you could see tortuous veins. On March 6th after some x-ray treatment we gave a few whiffs of ether in sitting posture, tied the peripheral blood vessels off by interrupted circumferential sutures, made a vertical incision down to the sternum, inserted the radium (50 mg.) into the wound, and immediately packed and compressed. The tendency to bleed was fearful, but compression and some clamps stopped it. The radium was left in only 7 hours. Four days later without anesthetic we made a groove into the manubrium sterni with Luer's rongeur shears. The bleeding forced us not to go farther. The radium was put into this sternal groove and left in for 23 hours. After this the patient felt easier, did not cough as much as before and began to sleep at night. On March 17th we went through the sternum and inserted the radium into the retro-sternal tumor mass. The tendency to bleed was incomparably less than previously, especially

than at the first incision. This time, and one week later, and again after another two weeks the radium was placed into the wound, each time for about 48 hours. In all the patient had 8600 milligram-hours. If we consider that this dose was given in the tumor, it is a very respectable dose and more than is usually given for instance in a carcinoma of the uterus. In addition we gave during that time (including two pre-operative treatments) five x-ray exposures (10 to 15 minutes, hard tube, with 3 mm. aluminum filter). Pain in the left shoulder was complained of for a while, but the general condition was greatly improved. The patient could sleep in his bed, up to eight hours in the night. He went to the theater, traveled to his home and came back during the eight weeks he was under our care, and was most enthusiastic. Three months later I was informed that he succumbed to what was declared a pneumonia."

"Carcinoma of the breast. We are of the impression that x-ray and radium have very materially improved the prognosis of our cases. We give pre-operative x-ray treatment for two days in order to stun the cells enough to make implantation less likely. Fat young women with soft fast growing carcinoma give a very bad prognosis, radium or no radium. The atrophic forms, which so often come late upon the operating table, and for this reason have greatly hurt or almost spoiled their operative chances, are definitely benefited by radium and x-ray. The treatment is not to necrose all carcinoma, but to increase the fibrotic strangling of the carcinoma nests. Even when the skin is perforated, healing may occur by patient use of moderate doses."

"Carcinoma of the bladder, prostate and rectum may be greatly benefited by radium. The female bladder is more accessible of course. But by suprapubic incision we can use the hot iron and then put the radium into place. In malignant papilloma this has worked quite well in our hands. In carcinoma of the prostate we have laid bare this organ as for a perineal prostatectomy and then either applied or inserted the radium under bulky walling off of the rectum. The rectum, especially the lower portion, does not stand radium well, and the patient complains bitterly of pain and tenesmus. Our procedure seemed therefore an improvement over the method of treatment, as advocated in the literature; but our experience in this field is quite limited."

"Carcinoma of the rectum is more of a surgical possibility than that of bladder and prostate. The inoperable forms and the post-operative recurrences are relegated to the radium treatment. The circular carcinomata of the upper rectum are the most favorable for radium or any treatment, because they remain comparatively long rather localized. Carcinoma of the lower portion of the ampulla involving the sphincter area is the most dreaded by the surgeon. And just here I have a result which is worth mentioning. In November 1919 a lady 65 years old, was brought to the office in a pitiable condition of pain, weakness and corrosion around the anus. A carcinoma in the lowest part of the ampulla recti involving the anal ring, had a diameter of about 6 cm. It was situated on the left and posterior wall, was ulcerated and the neighborhood was somewhat infiltrated. The lower border was protruding from the anus. The local and the general condition did not seem to warrant surgical measures. Radium was given in a—for this region—almost ruthless dose. She received at once 2400 milligram hours November 10, 1919. In February 1920 we gave another 2200 milligram hours. The patient improved splendidly. In November 1919, when

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first seen she only weighed 75 pounds. In February 1921 her weight was 115 pounds, a gain of about 40 pounds. Her only trouble now is a prolapsus of the rectum. The sphincter does not act; we had produced an extensive sloughing by the radium; but apart from a slight thickening in one place, all was healed and the patient is very happy over the result."

"This is an unusual case, as in other instances (especially when the growth was fixed solidly to the sacrum) the patients pay almost too dearly with pain for the small benefit which is principally psychic."

* * * *

S. A. Heyerdahl, M.D. (Christiania). Radium Treatment of Changes in the Thyroid Gland. *Acta Radiologica*, vol. i, fasc. 2, 207-218, Sept. 20, 1921.

"During my practice little opportunity has hitherto been given me to try to apply radium on the thyroid gland when subject to changes. One of the chief reasons why this has not been done is because preference has been given to the roentgen rays, and this is again chiefly due to the fact that the roentgen apparatuses have been established almost all over the country."

"While the radium, therapeutically applied, is concentrated in our country, so to say, in some very few institutes and infirmaries, the roentgen apparatuses, on the other hand, are installed in almost every infirmary in the country and also in numerous special institutes."

"Thus the roentgen rays have got a good lead and the favorable results that these rays can show in the case of the toxic goiter is the reason why the radiologists as a rule get patients suffering from this illness expressly for treatment with the roentgen rays and not with the radium ones."

"Altogether, radium is less known in our country as a remedy for struma and toxic goiter."

"When I, in spite of comparatively little experience as to the effects of radium by changes of the thyroid gland, have undertaken to read an introductory paper on this subject at the congress, then it is due to the fact that radium, according to my opinion, also ought to have a place in the sun next to his brother roentgen that lately seems earnestly to mean to knock him out from most of the domains of the therapeutic rays."

"In the year 1905 Abbe of New York treated a case of goiter by burying a radium tube in the gland and reported a remarkable success."

"Later on other workers, among them Wickham, Degrais, Dominici, Barcat, Aikins, Clagett, have used radium by external application and reported gratifying results."

"It is specially American physicians (and radiologists) who have launched radium as a treatment for goiter preferable not only to surgery but also to x-rays."

"One of the most experienced physicians in this domain, Dr Aikins (Toronto, Canada), has treated about 100 cases of this disease in the last twelve years."

"In acute cases he has found that treatment by radiation must be supplemented by (a) rest in bed, (b) dietetic treatment, and (c) treatment by drugs. The combined treatment is always more efficacious than either alone."

"In applying radium over the thyroid gland the radium is so screened as to prevent the action of the short but powerful beta rays and to obtain the benefit of the more penetrating gamma rays."

"Dr. Aikins prefers the flat applications (he uses most frequently 4 cm. x 4 cm. containing 10 mg. radium element). The plaques are screened with two thin aluminum screens or one fairly thick brass one (about 0.8 mm.), with a layer of felt."

"As a rule he makes applications of three hours duration, giving a first treatment of from 150 to 360 mg. hrs. He finds it preferable to give smaller doses rather frequently than concentrated heavy dosage. The first treatment is usually completed in three days and then he leaves an interval of about 6 weeks between applications."

"If the case is very advanced, the patient is treated in a hospital; less severe cases are treated in the Roentgen Institute for shorter periods."

"As compared with x-rays in the treatment of toxic goiter radium has the following advantages: (a) absolutely constant emission of rays, and therefore exact dosage possible; (b) far greater penetration of its rays, so that the deeper parts of the gland are reached; (c) no noisy exciting apparatus, so that the treatment can be applied at the bedside without in any way disturbing the patient."

"Dr. A. N. Clagett (Chicago) also prefers radium in the treatment of goiter. He has treated 47 cases of exophthalmic goiter with radium; the first case being treated in September, 1917. Of these cases six had already been operated on with recurrence of symptoms as bad or worse than before. Seventeen cases were declined as operable risks by some of the best surgeons."

"Two cases with very bad broken compensation of the heart have died since treatment from acute dilatation, one three months after treatment, the other five and a half months after."

"There have been good results in all the other cases and surgery has not been necessary after the radium treatment in a single one of the forty-seven cases."

"Conclusions—Dr. Clagett believes radium should be given a trial in exophthalmic goiter."

"First: There is no mortality, no scar, or pain, no long hospitalization. Three or four days suffice for the treatment."

"Second: Its advantage over the x-rays are no discoloration of the neck—less time consumed in the treatment—simpler to apply."

"Third: The thymus gland can be treated."

"Fourth: While surgery in removing proliferating cells leaves others behind and by ligating still leaves some of the blood supply more or less undisturbed, the selective action of the radium rays to a much greater degree destroys the harmful cells and also causes a much more symmetrical diminution of the blood supply."

"Fifth: It can be used in cases where surgery fears to venture or has failed."

"Sixth: Surgery has not been necessary after the radium treatment in one of the forty-seven cases."

"In the radium institute of the Rikshospital 16 cases of goiter, whereof 8 of pronounced toxic goiter and 8 of plain goiter without toxic symptoms or with milder nervous symptoms have been treated with radium since 1913."

"Added to this 8 cases of inoperable struma malignum, most of them of cancerous matter, have been treated with radium it being not

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quite out of the question that they could obtain temporary relief from their sufferings. Five of these patients have been temporarily improved."

"The 8 cases of plain goiter have been partly serious cases which have been subject to ray treatment, the goiter being either considered as inoperable or because it was thought connected with too great a risk to resort to operation or because it was thought connected with too great a risk to resort to operation or because the patient objected to operation."

"In all 8 cases the goiter has diminished through the radium treatment. In 2 cases almost complete cure was achieved; in 6 cases a change for the better."

"With the patients that suffered from nervous symptoms, these disappeared during the treatment."

"A few patients with big goiters and pronounced dyspnoea were quite relieved of this and the goiter was considerably reduced. An inconvenience by the radium treatment of plain goiter is the comparatively long time it takes before a notable improvement can be recorded and that in but few cases will the goiter disappear altogether."

"Another inconvenience which we also in some cases have experienced at the radium institute is the appearance of telangiectasis and atrophy of the skin, and especially in those cases where the radium treatment has been protracted and where during the whole time lead-filters of 1 mm. and 20 hours irradiation have been applied."

"As the skin of the throat is very sensitive to the radium irradiation, comparatively thick lead-filters must be applied, and the thickness of the filters will have to be increased gradually."

"In cases of plain goiter I do not believe the radium treatment will attain any general application, at any rate not by external irradiation."

"For treatment by radium (eventually roentgen rays) those cases will be appropriate where, for some reason or other, operation cannot be undertaken or where operation is combined with great risk."

"Most of the cases at the institute which were treated by radium irradiation were just such ones where operation for said reasons could not be undertaken."

"As a rule 80 to 160 mgm. of radium bromide in tubes with $1\frac{1}{2}$ to 3 mm. lead-filters distributed over the goiter have been used. Time of treatment—20 hours. The sittings have been repeated every six weeks or every month; up to ten sittings in all. The thickness of the lead-filters has been increased little by little up to a maximum of 3 mm. of lead."

"Of toxic goiter 8 cases have been treated with radium; whereof 1 case almost cured, 5 improved and 2 not cured. These patients have been under observation from 2 to 5 years. The treatment has continued for a period of from 3 months to 1 year."

"The radium treatment had an absolutely favorable influence on the general state of health and on the nervous symptoms. The sleep and appetite improved, the weight increased and the state of mind became more composed. The pulse calmed and the size of the goiter diminished. Least influence had the radium treatment on the exophthalmia."

"On a woman 30 years old (who got 2 sittings) with strongly developed exophthalmia and Moebius +, but without apparent enlargement of the thyroid gland the radium treatment had no curative effect.

The patient disappeared after the treatment in 2 sittings and she has not been heard of since."

"Another patient, a man 47 years old, was operated upon 5 months after the beginning of the radium cure. While treated by radium his state of health improved."

* * * *

John Albert Marshall, D.D.S., Ph.D. (San Francisco). A Laboratory and Clinical Study of the Bactericidal Action of Solutions of Radium Emanation. Cal. State Jour. of Med., 8-9, Jan. 1922.

"Recent observations upon the use of radium emanation indicate that there is a possibility of employing this substance in the treatment of chronic dental abscesses. Until further laboratory data can be obtained, it appears advisable to mention briefly the results thus far recorded, with the hope that other workers in this field may be sufficiently interested to verify some of the conclusions."

"The bactericidal action of radium has been studied particularly by Lequeux and Chrome, and Iridell and Minett. In their experiments they exposed different organisms to radium emanation for varying periods of time with a noticeable inhibitory effect upon the growth of cultures of streptococcus. Although the author has not repeated the experiments referred to above, his clinical findings are in apparent accord with the deductions offered. Bacteriological examinations of the treated canals indicated sterility in 85 per cent. of the cases. In fact, the summary presented points to the possibility of a new application of radium in the treatment of certain diseased conditions."

"The apparent success which has attended the radium therapy of skin lesions suggested the advisability of developing a modification of the present method of application which would make possible the study of the effects produced by this agent on chronic dental apical abscesses. A summary of nearly a year's observation of clinical cases shows that lesions of this type yield readily to the new therapy, and that up to the present time no untoward effects of the radium treatment have been observed."

"Through the courtesy of Dr. Howard Morrow, Dr. Laurence Tausig and Mr. L. B. Clark, it has been possible for the author to secure capillary tubes containing radium emanation. These tubes had been used in the skin clinic and eye clinic for various purposes until the "de-emanation" had proceeded to such an extent that further application for this work was purposeless. Although the degree of radiation is recorded in the tables in terms of millicuries, the measurement of the beta radiation from radium D and E has not been made."

"Radium emanation or niton is a gas, the disintegration products of which are solids. It is a solution of the solids which is being employed. That this solution contains alpha, beta and gamma rays is known, but the effect upon diseased tissue is perhaps due to the predominance of the beta radiation coming from radium D and E. It may be recalled that Tarnowsky quotes Hektoen to the effect that radium "emanation" inhibits phagocytosis and, hence, lowers the natural resistance of the affected part; but in these experiments I have employed, as already stated, a preponderance of the soft beta rays."

"A small amount of Ringer's solution may be rendered radio-active by crushing in it a capillary tube containing a known quantity of radium emanation. This operation is conveniently accomplished by placing the tubes in a sterilized mortar of about 20 cc capacity, covering the

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tubes with Ringer's solution and then crushing them. The preparation is transferred to a suitable container and carried to the operating-room. On account of the rapidity with which the radio-activity of this solution diminishes, it was found advisable in this research to crush the tubes at the exact time at which the experiment was performed, but no more than an hour was permitted to elapse between the preparation of the solution and its application in the clinic or laboratory."

"The radio-active liquid was carried to the root canals of the tooth by means of J. & J. sterilized cotton points. These were sealed in the canals for a period of from one to four days. Subsequently the treatment was removed, the pulp canals tested for sterility, and finally filled. With one possible exception, there has been no evidence of succeeding soreness or pain. The exception referred to is one in which the pericementitis resulted more probably from mechanical trauma incident to the previous curetting of the canal than to the action of the radium itself. The amount of solution carried to the tooth averaged 0.05 cc.; in this there was approximately 0.0630 millicuries of radium emanation. The variation in the dosage is noted in the appended table:

TABLE I

MILLCURIES OF TUBES*	MILLCURIES PER CC. OF SOLUTION	AMOUNT PLACED IN TOOTH
6.0	1.20 per cc.	.060 millicuries
7.9	1.58 per cc.	.079 millicuries
5.5	1.10 per cc.	.055 millicuries
4.6	0.92 per cc.	.046 millicuries
9.1	1.82 per cc.	0.91 millicuries
7.5	1.50 per cc.	.075 millicuries
6.3	1.26 per cc.	0.63 millicuries
5.3	1.06 per cc.	.053 millicuries
13.8	2.76 per cc.	.138 millicuries

TABLE II

Summary of Twenty-seven Cases

CLINICAL CONDITION	TREATMENT	RESULTS
Chronic apical abscess.	Radium applied four days.	Canals filled. No unfavorable symptoms after ten months.
Infected pulp with acute pericementitis.	Radium applied seven days.	Pericementitis very severe. Tooth extracted.
Chronic apical abscess of long standing.	Radium applied seven days, removed. Second treatment given.	Canals filled. No unfavorable symptoms after ten months.
Acute abscess.	Two treatments of radium of three days each.	Canals filled. No unfavorable symptoms after ten months.
Chronic apical abscess.	Two treatments of radium of three days each.	Canals filled. No unfavorable symptoms after ten months.

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